

EPA Observations on Plum Island Building 257

On June 18, 2018, representatives from EPA's Office of Land and Emergency Management's CBRN Consequence Management Advisory Division (CMAD) and Office of Research and Development's National Homeland Security Research Center (NHSRC) accompanied representatives of New York State Department of Environmental Conservation (NYSDEC) on a visit to Building 257 at the Plum Island Animal Disease Center (PIADC). The purpose of the visit was to view Building 257 (see Figure 1) in its current state so that recommendations could be made to the Department of Homeland Security (DHS), who operates the PIADC, and NYSDEC on potential options for releasing the building for sale.

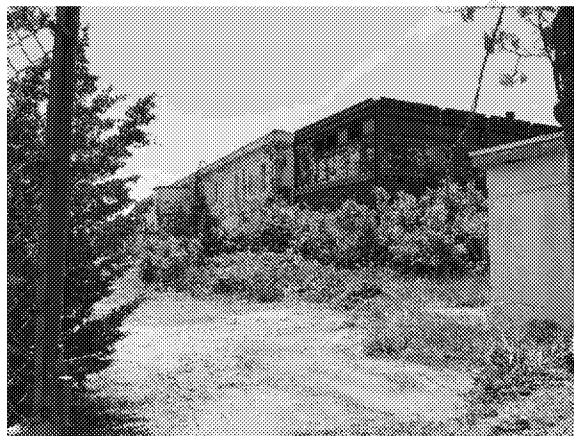


Figure 1. Outside View of Building 257

Building 257 had been used in the past to carry out animal disease research, using a variety of viral agents as well as some vegetative bacteria. No spore-forming bacteria (e.g., *Bacillus anthracis*) had reportedly been used in the building. The building has remained unused since the late 1990s, when it was decontaminated using diluted bleach (1:10 household bleach) on horizontal surfaces only. A fumigation with formaldehyde was planned, but never executed. The electric frying pans and electrical drop cords from the not-performed formaldehyde fumigation were spread throughout the building (see Figure 2).

In the Plum Island Animal Disease Center Building 257 Biorisk Assessment [1], January 2018, it states on page 11 that, "The Building 257 decontamination plan included entry into the building at the end of the formaldehyde fumigation step when concentrations of formaldehyde would be approximately 9,000 ppm (OSHA STEL of 2.0 ppm). Due to the extreme difficulty for personnel to access these areas safely while wearing appropriate personal protective equipment for this dangerous environment, it was determined to be too high of an occupational health risk to make entry for the recovery of the BIs and therefore the decontamination plan was not implemented." This seems an unlikely time to enter a building after fumigation. Usually, entry is not attempted until after the aeration phase of the fumigation, when concentrations are down near or below the OSHA PEL, or 0.75 ppm. There would be no need to collect the BIs before the building aeration and safer levels of formaldehyde were reached.



Figure 2. Electric Frypan Deployed for Formaldehyde Fumigation

Condition of the Building

The building appears to be more or less in the state it was when it was abandoned in the late 1990s, with the addition of 20 years of aging on the various surfaces. Although it appears that most papers and small laboratory equipment were removed, larger equipment (e.g., tables, autoclaves, boilers) appears to have been abandoned in place (see Figure 3). The floors appear to be mostly unpainted concrete. It is not known whether the concrete was sealed. There were a number of animal prep rooms that appeared to have either painted or epoxy-coated floors (see Figure 4). The paint (possibly lead-containing) on virtually every vertical and horizontal painted surface seems to be compromised (see Figures 5 and 6). The floors that were made from vinyl tile (possibly containing asbestos) were characterized by the edges of the tile lifting from the floor underneath (see Figure 7).

The compromised nature of the paint would make it problematic to perform surface decontamination operations due to difficulties in assuring wetting of the surfaces and the huge mess that would be generated by flaking paint being dislodged with even the gentlest force being applied to the surfaces. Acquiring reliable surface samples might also be difficult due to the condition of the paint, although the

surfaces in the animal prep rooms would be amenable to surface sampling using swabs, vacuums, or sponge sticks.



Figure 3. Abandoned Boiler



Figure 4. Animal Prep Room



Figure 5. Compromised paint on Vertical Surface



Figure 6. Compromised Paint on Horizontal Surface



Figure 7. Tile Floor Edges Peeling

Options for Releasing the Building for Sale

No matter what is done relative to the bio concerns, the NY property transfer requirements for sites potentially contaminated with hazardous materials will need to be complied with. Specifically, the lead-based paint and asbestos issues will need to be addressed regardless of what bio option is selected. Addressing the lead and asbestos issues may complicate the bio options. Additionally, in real-estate property transfer the outside soils may also have to be evaluated. Occasionally limited use deed restrictions are a component of reuse and that deed restriction would impact the risk receptors.

The building reportedly had not been used with spore-forming agents like *Bacillus anthracis*, but rather had been used for research involving viruses and vegetative bacteria. However, comprehensive records of all agents utilized in Building 257 over its entire tenure are not available. Given the length of time that has elapsed since the building was used (abandoned since the late 1990s), the risk due to the presence of residual agents, if indeed no spore-forming agents were investigated within Building 257, that were tested with in the building is very low [2] for persistence of viruses and vegetative bacteria]. A public perception issue persists because there is not detailed documentation of the surface

decontamination procedure that was performed (i.e., which surfaces were decontaminated?) and the fact that the formaldehyde fumigation was deemed worthwhile to conduct yet never carried out. These public perception issues are likely based on a lack of knowledge regarding the technical aspects of agent persistence, decontamination, and sampling. The likelihood of asbestos containing material and lead based paint impose a well-defined set of cleanup requirements in and of themselves. Based on our observations, EPA sees that there are several options available to overcome perceived and real microbial risk that may still be present in Building 257. Here are those options, along with advantages and disadvantages of those options.

Before deciding on an option, it would be very important to identify the eventual building usage because the eventual use of the building will have an influence on the potential risk that can be accepted.

Any decontamination approach should utilize a product that is approved for use by the EPA, under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Any exemption under Section 18 of FIFRA may be necessary. Note that if a non-registered product is selected a waiver of Section 18 could be obtained.

Table of Options (not in any order of priority)

Option	Description	Advantages	Disadvantages
Option 1: Do Nothing (relative to the bio issues). The Pb and ACM as well as any other potential contamination would have to be addressed prior to reuse.	The building has not been used since the 1990s. Viral agents and vegetative bacteria are not likely to have survived the intervening 20 years. A surface decontamination was performed prior to the building's abandonment. Remediation activities to deal with the asbestos and lead paint will likely remove many potential deposition locations for microbial contamination.	Simplest Option. Low Cost.	Does not overcome public concerns about the building. Does not address residual risk from the low likelihood that spore-forming agents (i.e., <i>Bacillus anthracis</i>) were utilized in Building 257 but never documented. The removed paint and material may still require some sort of treatment or sampling prior to disposal to deal with any suspected residual bio-agents.
Option 2: Perform a Surface Decontamination of the Building	A surface decontamination using diluted bleach, pH-adjusted bleach, or another aqueous disinfectant could be performed on the entire building (vertical, horizontal, inverted surfaces).	This would further reduce the low risk from potentially surviving microbes.	The condition of the paint in the building suggests that using even low-pressure spray to apply the aqueous disinfectants would dislodge a lot of the loosely hanging paint flakes, making a huge mess that might impact later activities to remove lead paint. The hanging shards of paint would make it difficult to assure complete coverage of all the potentially contaminated surfaces. It would be a large effort to manually spray this building, requiring either SCBA or air hoses due to potentially IDLH levels of chlorine gas. Possibly SCBA with engineering controls and monitoring Level A unlikely. Due to the nature of the peeling paint there may be a need to remove and collect the chips prior to any decontamination of the building. The collected chips may also need to be decontaminated separately which would add an

Option	Description	Advantages	Disadvantages
			additional operation and potential disposal issues for the chips and spent decon agent(s).
Option 3: Carry out the Formaldehyde Fumigation that was Originally Planned or Fumigate with Another Fumigant	The formaldehyde fumigation originally planned for the building would have been a viable means to disinfect the building. The fumigation had been planned and necessary calculations for time and quantities of formaldehyde have been performed.	<p>The planning documentation has been prepared and nominally approved.</p> <p>Other fumigants like chlorine dioxide would also have a likely high degree of success.</p> <p>Biological Indicator strips could be used to assess performance of the decontamination procedures.</p>	<p>The condition of the frypans and drop cords is questionable. It likely will be necessary to deploy all new frypans and drop cords throughout the building.</p> <p>There will be health and safety issues with using formaldehyde, due to its toxicity.</p>
<p>Option 4: Perform Sampling to Assess Residual Agents</p> <p>Might further discuss this option with NYSDEC. The issues highlighted in the disadvantages section are relevant but lines of evidence, level of effort necessary to make 'reasonable' risk decisions and politics may result Option 4 being a very viable option.</p>	Environmental sampling to assess the potential presence of residual viruses and bacteria is a potential option.	Non-detect of organisms of interest would help demonstrate that microbial risk would be minimal.	<p>Some of the organisms are naturally occurring and might be present due to reasons unrelated to the activities originally occurring in Building 257.</p> <p>There are no validated environmental sampling methods for reliably acquiring samples from many of the surfaces of concern in the building.</p> <p>Many samples would need to be acquired on such a large complex building; cost would not be trivial.</p> <p>The number of samples needed to support statistical statements of confidence would be significant (i.e., several hundred). Perhaps composite surface and/or bulk air sampling could be conducted commensurate with possible reuse thus minimizing the need for 100s of samples. Proving the negative is challenging but lines of evidence could help.</p>

Option	Description	Advantages	Disadvantages
			<p>Analysis for numerous agents within each sample will significantly increase cost and logistics. Validated analytical methods, to verify viability or infectivity may not be available for all agents of interest.</p> <p>Without complete documentation of which agents were investigated over Building 257's entire tenure, deciding upon analytical targets could be challenging.</p> <p>Sampling is but one line of evidence. Positive samples may not indicate the existence of risk (i.e., if no exposure risk is present, or if agent is present but not viable); and absence of positive samples does not indicate the absence of risk (i.e., agent may be present but undetected).</p>
Option 5: Fumigate with Low Concentration Hydrogen Peroxide Vapor [3,4]	In the last several years, new approaches for inexpensive decontamination of infrastructure from biological organisms have been developed by EPA. One such technique is the use of off-the-shelf humidifiers to release hydrogen peroxide vapor from off-the-shelf hydrogen peroxide solutions for fumigation. These low-tech fumigations occur over a period of several days and have been proven effective against spore-forming bacteria on many surfaces that are present in Building 257.	<p>Relatively inexpensive.</p> <p>Fairly effective against spore-formers and likely even more effective against viruses and vegetative bacteria.</p> <p>Would disinfect the "hanging paint".</p> <p>Building could be sub-compartmented to allow for decontamination of smaller areas rather than the entire building at one time.</p> <p>Biological Indicator strips could be used to assess performance of the decontamination procedures.</p>	<p>Unpainted concrete is one of the surfaces that act as a sink for hydrogen peroxide, lessening its effectiveness on those surfaces. A supplemental surface treatment of the concrete floors could be done.</p> <p>Forced mixing of fumigant within Building 257 may be challenging. Some concealed spaces may need to be treated separately or with an alternative approach.</p> <p>This approach is experimental, not validated or registered for use by the Federal Insecticide, fungicide, rodenticide act (FIFRA).</p>

References

1. Plum Island Building 257 Biorisk assessment.
2. US EPA, 2014, Persistence of Categories A and B Select Agents in Environmental Matrices. U.S. Environmental Protection Agency, Office of Research and Development, National Homeland Security Research Center, Washington, DC, **EPA/600/R-14/074**, June 2014.
3. US EPA, 2017, Low-Concentration Hydrogen Peroxide (LCHP) Vapor for Bioremediation Assessment and Evaluation Report, Office of Land and Emergency Management, **EPA/600/R-17/XXX**.
4. Wood, J.P., Calfee, M.W., Clayton, M., Griffin-Gatchalian, N., Touati, A., Ryan, S., Mickelsen, L., Smith, L., and Rastogi, V., 2016, A simple decontamination approach using hydrogen peroxide vapour for Bacillus anthracis spore inactivation, *Journal of Applied Microbiology*, **121**, 1603-1615.